Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-08/0307 of 23 August 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Hilti screw anchor HUS
Product family to which the construction product belongs	Concrete screw for use in concrete
Manufacturer	Hilti Aktiengesellschaft 9494 SCHAAN FÜRSTENTUM LIECHTENSTEIN
Manufacturing plant	Hilti Werke
This European Technical Assessment contains	15 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330232-00-0601
This version replaces	ETA-08/0307 issued on 27 August 2015

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Specific Part

1 Technical description of the product

The Hilti screw anchor HUS is made of galvanised steel (HUS –H) of size 10 or made of stainless steel (HUS –HR; –CR) of sizes 6, 8, 10 and 14. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi-static loading	See Annex C1
Characteristic resistance for seismic performance Category C1	See Annex C2
Characteristic resistance for seismic performance Category C2	No performance assessed
Displacements	See Annex C4

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C3

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document EAD 330232-00-0601, the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

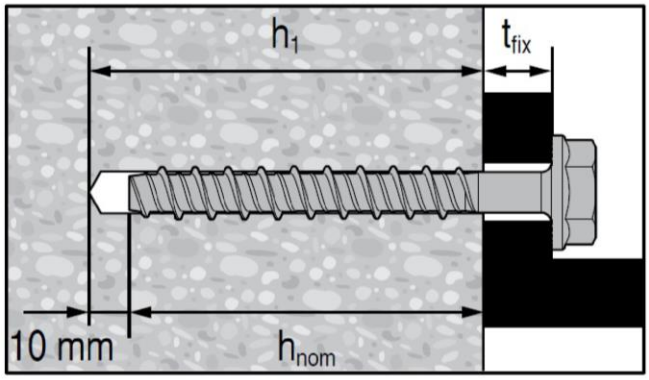
Issued in Berlin on 23 August 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Lange

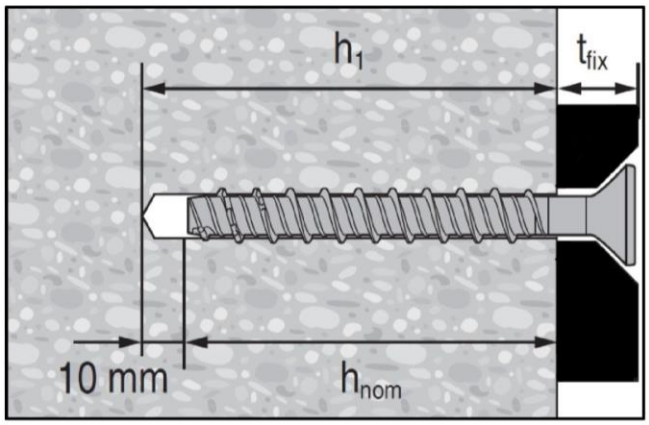
Deutsches Institut für Bautechnik

Product and installed condition



HUS-H (hexagonal head, sizes 10)

HUS-HR (hexagonal head, sizes 6, 8, 10 and 14)



HUS-CR (countersunk head, sizes 6, 8 and 10)

Hilti screw anchor HUS	**Annex A1**
Product description Installed condition	

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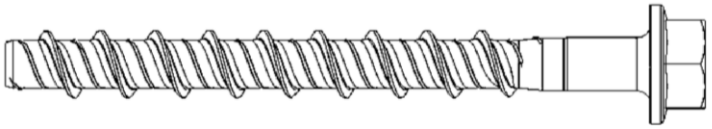
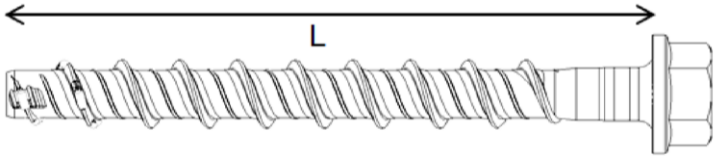
Table A1: Screw types

HUS-H 10
Hexagonal head



HUS-HR 6
HUS-HR 8
HUS-HR 10
HUS-HR 14
Hexagonal head



HUS-CR 6
HUS-CR 8
HUS-CR 10
Countersunk head

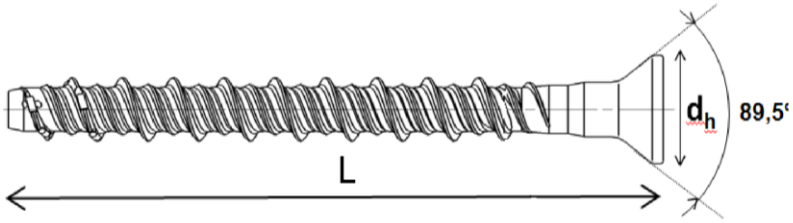


Table A2: Materials

Part	Designation	Material	
Screw anchor HUS-H	Size 10 all lengths	$f_{yk} \geq 860$ N/mm², $f_{uk} \geq 1000$ N/mm²	Carbon steel, galvanized (≥ 5 µm) Rupture elongation $A_5 \leq 8\%$
Screw anchor HUS-HR and HUS-CR	Size 6 all lengths	$f_{yk} \geq 900$ N/mm², $f_{uk} \geq 1050$ N/mm²	Stainless steel (A4 grade) Rupture elongation $A_5 > 8\%$
	Size 8 all lengths	$f_{yk} \geq 745$ N/mm², $f_{uk} \geq 870$ N/mm²	
	Size 10 all lengths	$f_{yk} \geq 815$ N/mm², $f_{uk} \geq 950$ N/mm²	
	Size 14 all lengths	$f_{yk} \geq 590$ N/mm², $f_{uk} \geq 690$ N/mm²	

Hilti screw anchor HUS	**Annex A2**
Product description Screw types and materials	

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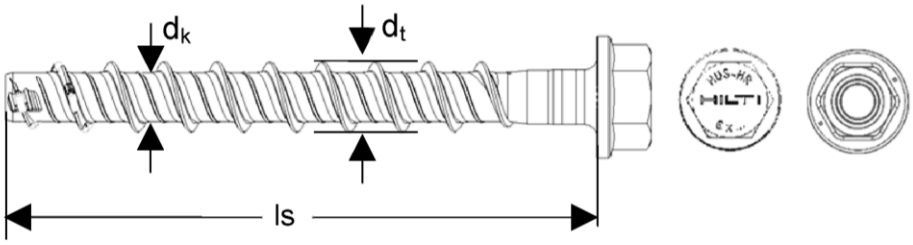
Table A3: Fastener dimensions and marking

Fastener size HUS			**6**	**8**		**10**				**14**	
Type			**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal embedment depth		[mm]	55	60	80	70	90	70	85	70	110
Threaded outer diameter	d_t	[mm]	7,6	10,1		12,3		12,3		16,6	
Core diameter	d_k	[mm]	5,4	7,05		8,4		8,4		12,6	
Stressed section	A_s	[mm²]	22,9	39,0		55,4		55,4		143,1	



Head stamp:

e.g. Hilti HUS-HR 8 x …
or circle marks

HILTI	…Manufacturer	
HUS	…**H**ilti **U**niversal **S**crew anchor	Type
e.g. „H“ resp. circle marks	…Head configuration (H, C)	Type
R	…Corrosion **R**esistance (stainless steel, grade A4)	Type
8	…Nominal anchor diameter/ drill bit diameter (6…14)	
…	…Nominal anchor length (l_s)/ under head length	

Hilti screw anchor HUS	**Annex A3**
Production description Fastener dimensions and marking	

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loadings: all sizes and all embedment depths.
- Seismic action for performance category C1:
  sizes 8, 10 and 14, for maximum embedment depth only (h_{nom2}).
- Fire exposure: all sizes and all embedment depths.

Base materials:
- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Non-cracked or cracked concrete.

Use conditions (Environmental conditions):
- Anchorages subject to dry internal conditions: all screw types.
- Anchorages subject to dry internal conditions or external atmospheric exposure including industrial and marine environment or permanently damp internal condition, if no particular aggressive conditions exist: screw types made of stainless steel (HUS-HR, CR).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Anchorages are designed in accordance with:
  FprEN 1992-4:2016 and EOTA Technical Report TR 055, 12/2016

Installation:
- Hammer drilling only: all sizes and all embedment depths.
- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the fastener must not be possible.
- The head of the fastener must be supported on the fixture and is not damaged.

Hilti screw anchor HUS	**Annex B1**
Intended use Specifications	

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Table B1: Installation parameters

Fastener size HUS			**6**	**8**		**10**				**14**	
Type			**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
			h_{nom}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}	h_{nom1}	h_{nom2}
Nominal embedment depth	h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Nominal drill hole diameter	d_0	[mm]	6	8		10		10		14	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	8,45		10,45		10,45		14,50	
Clearance hole diameter	$d_f \leq$	[mm]	9	12		14		14		18	
Wrench size	SW	[mm]	13	13		15		15		21	
Torx size	TX	[-]	T30	T45		T50		-		-	
Countersunk head diameter (CR)	d_h	[mm]	11	18		21		-		-	
Countersunk head height (CR)	h_h	[mm]	4,3	6,3		7,0		-		-	
Depth of drill hole in floor/ wall position	$h_1 \geq$	[mm]	65	h_{nom} + 10mm		h_{nom} + 10mm		h_{nom} + 10mm		h_{nom} + 10mm	
Depth of drill hole in ceiling position	$h_1 \geq$	[mm]	58	h_{nom} + 10mm		h_{nom} + 10mm		h_{nom} + 10mm		h_{nom} + 10mm	
Installation Torque	T_{inst}	[Nm]	- [1]	- [1]		45 [2]		45	55	65	
Setting tool	Strength class	≥ C20/25	Impact screw driver, e.g. Hilti SIW 14-A or 22-A [3]	Impact screw driver, e.g. Hilti SIW 22T-A [3]							

[1] Hand setting in concrete base material not allowed (machine setting only).
[2] Installation torque referred to HUS-HR only.
[3] Hilti recommended electrical impact screw drivers are listed in the instruction for use included in the sales box.

Hilti screw anchor HUS	**Annex B2**
Intended use Installation parameters	

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Table B2: Minimum thickness of concrete member, minimum edge distance and spacing

Fastener size HUS				**6**	**8**		**10**				**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
Nominal embedmenth depth		h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Minumum thickness of concrete member		h_{min}	[mm]	100	100	120	120	140	110	130	140	160
Cracked concrete	Minimum spacing	s_{min}	[mm]	35	45	50	50		50		50	60
	Minimum edge distance	c_{min}	[mm]									
Non-cracked concrete	Minimum spacing	s_{min}	[mm]	35	45	50	50		65		50	60
	Minimum edge distance	c_{min}	[mm]									

Table B3: Screw length and maximum thickness of fixture

Fastener size	**6**		**8**				**10**						**14**	
Type	**HR**	**CR**	**HR**		**CR**		**HR**		**CR**		**H**		**HR**	
Nominal embedment depth [mm]	h_{nom1} 55		h_{nom1} 60	h_{nom2} 80	h_{nom1} 60	h_{nom2} 80	h_{nom1} 70	h_{nom2} 90	h_{nom1} 70	h_{nom2} 90	h_{nom1} 70	h_{nom2} 85	h_{nom1} 70	h_{nom2} 110
Length of screw [mm]	Thickness of fixture [mm]													
	t_{fix1}		t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}	t_{fix1}	t_{fix2}
60	5	5												
65			5											
70	15	15												
75			15		15		5						10	
85			25	5			15		15					
95			35	15	35	15	25	5						
105			45	25			35	15	35	15				
115							45	25						
120													50	10
135													65	25
140							60	40						
200											130	115		
240											170	155		
280											210	195		

Hilti screw anchor HUS

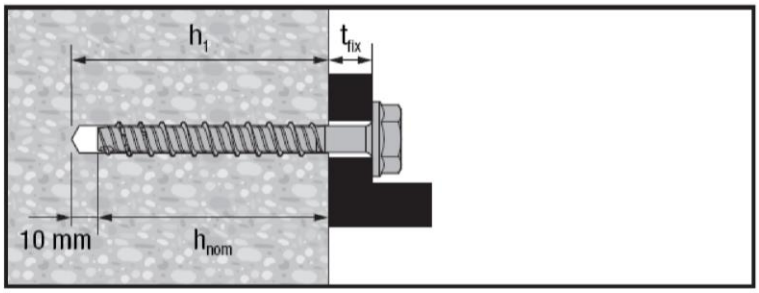
Intended use
Minimum concrete thickness and minimum edge distance and spacing.
Screw length and thickness of the fixture

Annex B3

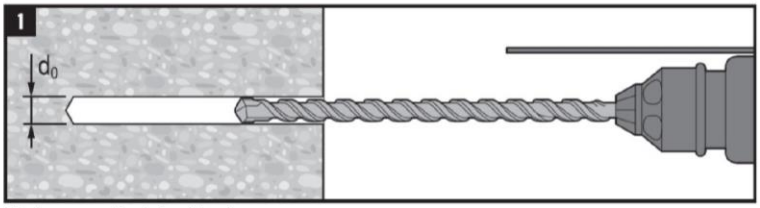
Deutsches Institut für Bautechnik

DIBt

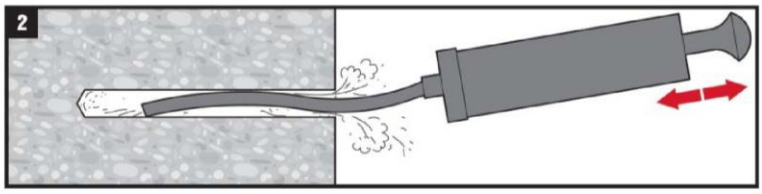
Installation instruction



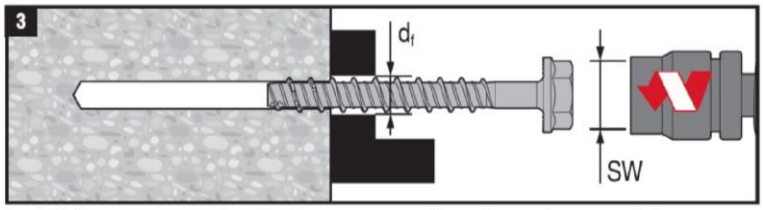
Anchor after installation;



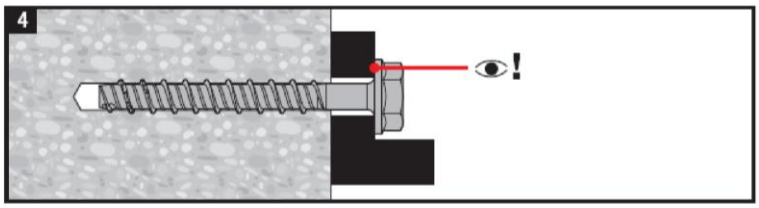
Make a cylindrical hole;



Clean the hole;



Install the screw anchor by torque wrench or impact screw driver according to Annex B2, Table B1;



Ensure that the head of the anchor is fully supported on the fixture and it is not damaged.

Hilti screw anchor HUS	**Annex B4**
Intended use Installation instruction	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of resistance in case of static and quasi-static loading

Fastener size HUS				**6**	**8**		**10**				**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
Nominal embedment depth		h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Steel failure for tension and shear load												
Characteristic resistance		$N_{Rk,s}$	[kN]	24,0	34,0		52,6		55,4		102,2	
Partial factor		$\gamma_{Ms,N}$ [1]	[-]	1,4								
Characteristic resistance		$V_{Rk,s}$	[kN]	17,0	26,0		33,0		23,8		55,0	77,0
Partial factor		$\gamma_{Ms,V}$ [1]	[-]	1,5								
Ductility factor		k_7	[-]	1,0	1,0		1,0		0,8		1,0	
Characteristic resistance		$M^0_{Rk,s}$	[Nm]	19	36		66		70		193	
Pull-out failure												
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	5	6	12	9	16	7,5	16	12	25
Characteristic resistance in non-cracked concrete C20/25		$N_{Rk,p}$	[kN]	9	12	16	16	25	12	20	- [2]	- [2]
Increasing factor for concrete ψ_c	C30/37		[-]	1,22	1,22		1,22		1,17	1,22	1,22	
	C40/50		[-]	1,41	1,41		1,41		1,32	1,41	1,41	
	C50/60		[-]	1,58	1,58		1,58		1,44	1,58	1,58	
Concrete cone and splitting failure												
Effective anchorage depth		h_{ef}	[mm]	45	47	64	54	71	54	67	52	86
Factor for	Cracked	$k_1 = k_{cr,N}$	[-]	7,7								
	Non-cracked	$k_1 = k_{ucr,N}$	[-]	11,0								
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}	1,5 h_{ef}		1,5 h_{ef}		1,5 h_{ef}		1,5 h_{ef}	
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}	3 h_{ef}		3 h_{ef}		3 h_{ef}		3 h_{ef}	
Splitting failure	Edge distance	$c_{cr,sp}$	[mm]	1,5 h_{ef}	1,5 h_{ef}		1,8 h_{ef}		1,5 h_{ef}		1,8 h_{ef}	
	Spacing	$s_{cr,sp}$	[mm]	3 h_{ef}	3 h_{ef}		3,6 h_{ef}		3 h_{ef}		3,6 h_{ef}	
Installation factor		γ_{inst}	[-]	1,4	1,2		1,2		1,2	1,4	1,2	
Concrete pry-out failure												
Pry-out factor		k_8	[mm]	1,5	2,0		2,0		2,0		2,0	
Concrete edge failure												
Effective length of anchor		$l_f = h_{ef}$	[mm]	45	47	64	54	71	54	67	52	86
Effective diameter of anchor		d_{nom}	[mm]	6	8		10				14	

[1] In absence of other national regulations.
[2] Pull-out failure is not decisive.

Hilti screw anchor HUS

Annex C1

Performances
Characteristic values for resistance under static and quasi-static action

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Table C2: Characteristic values of resistance in case of seismic performance category C1

Fastener size HUS				**8**	**10**		**14**
Type				**HR, CR**	**HR, CR**	**H**	**HR**
Nominal embedment depth		h_{nom}	[mm]	80	90	85	110
Steel failure for tension and shear load							
Characteristic resistance		$N_{Rk,s,seis}$	[kN]	34,0	52,6	55,4	102,2
Partial factor		$\gamma_{Ms,N}$ [1)]	[-]	1,4			
Characteristic resistance		$V_{Rk,s,seis}$	[kN]	11,1	17,9		53,9
Partial factor		$\gamma_{Ms,V}$ [1)]	[-]	1,5			
Pull-out failure							
Characteristic resistance in cracked concrete		$N_{Rk,p,seis}$	[kN]	7,7	12,5		17,5
Concrete cone failure							
Effective embedment depth		h_{ef}	[mm]	64	71	67	86
Concrete cone failure	Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}	1,5 h_{ef}	1,5 h_{ef}	1,5 h_{ef}
	Spacing	$s_{cr,N}$	[mm]	3 h_{ef}	3 h_{ef}	3 h_{ef}	3 h_{ef}
Installation factor		γ_{inst}	[-]	1,2	1,2	1,4	1,2
Concrete pry-out failure							
Pry-out factor		k_8	[-]	2,0	2,0	2,0	2,0
Concrete edge failure							
Effective length of fastener		$l_f = h_{ef}$	[mm]	64	71	67	86
Outside diameter of fastener		d_{nom}	[mm]	8	10		14

[1)] In absence of other national regulations.

Hilti screw anchor HUS	**Annex C2**
Performances Characteristic values for resistance under seismic actions, performance category C1	

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Table C3: Characteristic resistance under fire exposure

Fastener size HUS				**6**		**8**				**10**								**14**	
Type				**HR**	**CR**	**HR**		**CR**		**HR**		**CR**		**H**		**HR**			
Nominal embedment depth		h_{nom}	[mm]	55		60	80	60	80	70	90	70	90	70	85	70	110		
Steel failure for tension and shear load ($F_{Rk,s,fi} = N_{Rk,s,fi} = V_{Rk,s,fi}$)																			
Characteristic resistance	R30	$F_{Rk,s,fi}$	[kN]	4,9	0,2	9,3		0,8		18,5		1,4		5,0		41,7			
	R60	$F_{Rk,s,fi}$	[kN]	3,3	0,2	6,3		0,6		12,0		1,1		3,6		26,9			
	R90	$F_{Rk,s,fi}$	[kN]	1,8	0,2	3,2		0,5		5,4		0,9		2,2		12,2			
	R120	$F_{Rk,s,fi}$	[kN]	1,0	0,1	1,7		0,4		2,4		0,8		1,5		5,4			
	R30	$M^0_{Rk,s,fi}$	[Nm]	4,0	0,2	8,2		0,8		19,4		1,5		6,3		65,6			
	R60	$M^0_{Rk,s,fi}$	[Nm]	2,7	0,2	5,5		0,7		12,6		1,2		4,6		42,4			
	R90	$M^0_{Rk,s,fi}$	[Nm]	1,4	0,1	2,8		0,5		5,7		0,9		2,8		19,2			
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,8	0,1	1,5		0,4		2,5		0,8		1,9		8,5			
Concrete pull-out failure																			
Characteristic resistance	R30 R60 R90	$N_{Rk,p,fi}$	[kN]	1,3		1,5	3,0	1,5	3,0	2,3	4,0	2,3	4,0	1,9	4,0	3,0	6,3		
	R120	$N_{Rk,p,fi}$	[kN]	1,0		1,2	2,4	1,2	2,4	1,8	3,2	1,8	3,2	1,5	3,2	2,4	5,0		
Edge distance																			
R30 to R120		$c_{cr,fi}$	[mm]	2 h_{ef}															
Anchor spacing																			
R30 to R120		$s_{cr,fi}$	[mm]	4 h_{ef}															
Concrete pry-out failure																			
R30 to R120		k	[-]	1,5		2,0				2,0						2,0			

Hilti screw anchor HUS

Annex C3

Performances
Characteristic resistance under fire exposure

Deutsches Institut für Bautechnik DIBt

Table C4: Displacements under tension loads

Fastener size HUS				**6**	**8**		**10**				**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
Nominal anchorage depth		h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Cracked concrete C20/25 to C50/60	Tension load	N	[kN]	1,7	2,4	4,8	3,6	6,3	3,0	4,1	4,8	9,9
	Displacement	δ_{N0}	[mm]	0,4	0,5	0,7	0,3	0,6	0,2	0,3	0,9	1,4
		$\delta_{N\infty}$	[mm]	0,5	0,7	1,1	0,6	1,1	0,3	0,7	1,1	1,4
		$\delta_{N,seis}$	[mm]	-	-	1,2	-	1,2	-	1,2	-	0,4
Non-cracked concrete C20/25 to C50/60	Tension load	N	[kN]	3,1	4,8	6,3	6,3	9,9	4,8	6,8	7,5	16,0
	Displacement	δ_{N0}	[mm]	0,8	0,7	1,6	0,3	1,3	0,2	0,3	0,7	1,0
		$\delta_{N\infty}$	[mm]	0,8	0,7	1,6	0,3	1,3	0,3	0,7	0,7	1,0

Table C5: Displacements under shear loads

Fastener size HUS				**6**	**8**		**10**				**14**	
Type				**HR, CR**	**HR, CR**		**HR, CR**		**H**		**HR**	
Nominal anchorage depth		h_{nom}	[mm]	55	60	80	70	90	70	85	70	110
Cracked and Non-cracked concrete C20/25 to C50/60	Shear load	V	[kN]	7,8	11,0	12,4	13,6	15,7	10,3	10,3	12,9	27,3
	Displacement	δ_{V0}	[mm]	0,4	2,0	2,3	1,1	1,7	1,5	1,5	3,5	3,9
		$\delta_{V\infty}$	[mm]	0,5	2,4	2,9	1,5	2,4	2,3	2,3	3,9	4,3
		$\delta_{V,seis}$	[mm]	-	-	4,8	-	5,3	-	5,3	-	7,6

Hilti screw anchor HUS	**Annex C4**
Performances Displacements under tension and shear loads	